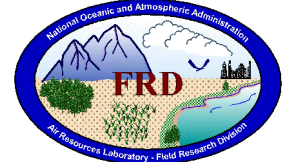


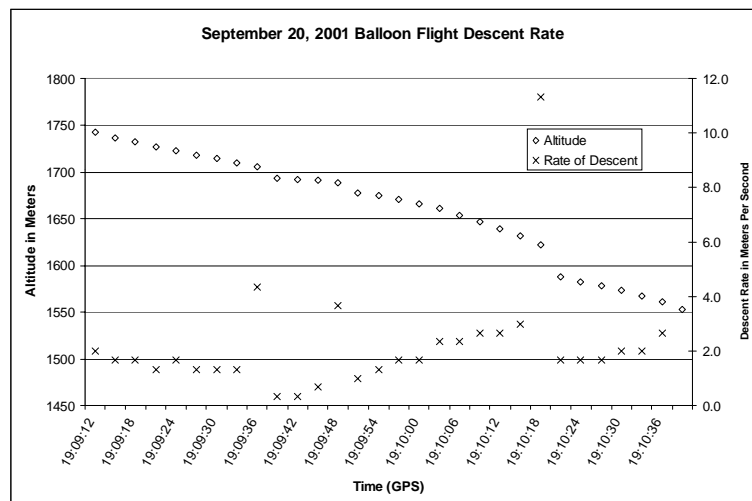
# FRD Activities Report December 2001



## Research Programs

### *Hurricane Balloon*

Data from the September 20, 2001, balloon flight is being used to determine if the hurricane balloon can meet one of the Aircraft Operations Center (AOC) and the 53<sup>rd</sup> Weather Reconnaissance Squadron (53<sup>rd</sup> WRS) requirements to be capable of descending in 20 meters per second updraft conditions. Figure 1 shows the descent during final 2.5 minutes of flight as the balloon descended to the ground after a cut down command was sent to the balloon transponder. The average descent rate for the final minute of flight is about 2.4 meters per second. This is important because if we are unable make the balloon descend at a rate of 20+ meters per second we will be unable to meet AOC and 53<sup>rd</sup> WRS requirement to descend in 20 meters per second updraft conditions.



As the helium escapes from the balloon, the balloon does not become aerodynamic; it transitions into the shape of a pumpkin as seen from an angle above and looking down on the balloon (description from observers in the aircraft used to chase the balloon). This means that the balloon does not become very aerodynamic and the large surface area keeps the balloon from descending at a rate anywhere near the required 20+ meters per second.

Some consideration has been given to designing a destructive (destroy the balloon shell and bladders) type of cut down. However, accidental activation of this type of destruct could be dangerous to those involved in its inflation and operation. We are also not expert or even experienced with this type of balloon cut down. Just the accidental instantaneous release of the balloon super pressure (balloon shell destruct) could be dangerous for the balloon operations people. Even if a balloon destruct command were executed, there is no reassurance that the balloon will become aerodynamic rather than catching the air like a boat sail.

Further work on the balloon cut down or a relaxation of requirements will be required before one of these balloons will be launched into a hurricane. (Randy. Johnson@noaa.gov)

## ***URBAN 2000/VTMX***

A NOAA Technical Memorandum is in preparation that describes the meteorological instrumentation set up and operated by FRD during URBAN 2000 and VTMX in October of 2000. Two different sites were utilized. The first was a continuously operating sodar and radar profiler site at the Raging Waters water park, which also was a site for a meteorological tower to measure standard surface parameters. The second site was a 3-D sonic anemometer site in the downtown area near the tracer release site that operated only during tracer releases. The Tech Memo will be finished and in review in early January. (Kirk.Clawson@noaa.gov and Jerry Crescenti)

## ***Tracer Technology***

A commercial instrument manufacturer recently announced a micro-machined Field Asymmetric Ion Mobility Spectrometer (FAIMS). The instrument weighs just 2 pounds and is designed to measure very small concentrations of gases. At our request, the manufacturer is testing the instruments sensitivity to Sulfur Hexafluoride ( $\text{SF}_6$ ). They hope to have some results by mid-January. Our current continuous  $\text{SF}_6$  analyzers weigh about 25 pounds and require a supply of compressed nitrogen and hydrogen while operating. If the FAIMS work, they offer significant size advantages which would allow a wider variety of sampling deployments. (Roger.Carter@noaa.gov)

## **Cooperative Research with INEEL**

### ***INEEL Support***

FRD received a request in December to create joint frequency distributions for the winds at specific INEEL Mesonet towers using data from calendar year 2001. This work is part of FRD's annual support to INEEL. The Site wants the joint frequency distributions to be completed by late January. Software for computing the distributions was developed last year, so the computations will not take as long this year. (Richard.Eckman@noaa.gov)

### ***INEEL Mesoscale Modeling***

The Alpha workstation used for MM5 modeling at FRD malfunctioned yet again in December. It malfunctioned the first time last summer, and came back online only in October. At a minimum, it looks like the video card has failed this time around. The computer is no longer under warranty. Given the purchase cost, the reliability of this workstation has been highly unsatisfactory. FRD uses several inexpensive PCs as servers, and they have run for years without problems. In contrast, the Alpha workstation has suffered major failures within just two years. FRD is now considering whether a PC-type computer should be acquired as a backup (or eventual replacement) for the Alpha system. Some of the latest Intel processors appear to have floating-point performances comparable to the Alpha.

Before the Alpha workstation malfunctioned, several improvements were made to the MM5 forecasts at FRD. A program was written to print out hourly time series of meteorological conditions at specific points within the model domain. The output includes forecast winds, temperature, humidity, and precipitation. Time series for specific INEEL facilities will eventually be put out on the network so that FRD staff can use them in developing forecasts for INEEL. Work was also under way to improve the MM5 initialization. Currently, data from the INEEL Mesonet are used only for the initial conditions. An alternative being investigated is a dynamic initialization, in which Mesonet data are used to nudge MM5 variables over a spin-up period lasting up to 3 hours. The main disadvantage of this approach is that the overall length of the model simulations will be increased. (Richard.Eckman@noaa.gov)

## **Other Activities**

### ***Outreach***

Jeff French discussed basic meteorology and properties of materials with students from a local elementary school in Idaho Falls. The three 1.5-hour sessions covered the basics of mass, density, buoyancy, temperature, and radiation and how these concepts are important in cloud formation, wind generation, and temperature. The children participated in a two week-long laboratory session that included hourly measurements of temperature, dew point, solar radiation, and cloud cover. During the last session, the students interpreted their measurements based on what they had learned during previous sessions. (Jeff.French@noaa.gov)



### ***First International NAERS Workshop***

FRD staff are preparing to host the First International Workshop of the Network of Airborne Environmental Research Scientists (NAERS) on January 28 and 29, 2002. NAERS is an international network of scientists cooperating in the use of Small Environmental Research Aircraft (SERA), airborne instrumentation, and airborne data to investigate and solve environmental problems. The workshop goal is to enhance the effectiveness of airborne research efforts and the utility of the resulting science. At last count, 25 scientists from eight countries will attend. The agenda for the workshop is at <http://www.noaa.inel.gov/docs/workshop.pdf> (Tim.Crawford@noaa.gov, Jerry Crescenti and Jeff French)

### ***Proposals***

*An Investigation of Internal Gravity Waves and Turbulence in the Stable Planetary Boundary Layer* by Carmen Nappo and Richard M. Eckman. Submitted to the Army Research Office as part of the CASES project. A joint effort with Jielun Sun at NCAR.

*Small-Scale Spatial Variations in CO<sub>2</sub> Flux: Measurement and Interpretation* by Gennaro H. Crescenti, Timothy L. Crawford, Ronald J. Dobosy, Douglas C. Vandemark, and Mark D. Dowell, submitted to NASA Research Announcement NRA 01-OES-03 — Ocean, Ice, and Climate.

### ***Papers***

Crescenti, G. H., J. R. French, and T. L. Crawford, 2001: Aircraft measurements in the Coupled Boundary Layers Air-Sea Transfer (CBLAST) light wind pilot field study. NOAA Technical Memorandum OAR ARL-241, Silver Spring, MD, 82 pp.

Mahrt, L., D. Vickers, J. Sun, T. L. Crawford, G. Crescenti, and P. Frederickson, 2001: Surface stress in offshore flow and quasi-frictional decoupling. *Journal of Geophysical Research*, **106**, 20629-20639.

### ***Personnel***

Debbie Lacroix has changed her employment status to part-time permanent, effective December 16, 2001.

### ***Travel***

Kirk Clawson to Crystal City, VA to attend the Workshop on Effective Emergency Response, sponsored by the Office of the Federal Coordinator for Meteorology, 8-11 December 2001.

### ***Visitors***

Fernando Roman and Warren Ulmer visited the FRD Laboratory on December 13. Fernando Roman is the Air Quality Coordinator for Wind River Environmental Quality Conditions. They discussed with Randy Johnson the FRD field work capabilities for sampler operation, tracer deployment and sample analysis.